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Applied Climatology (ECAC)
Trieste, Italy

Predictability assessment of climate predictions within the context of the NEWA project

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CENER | NATIONAL RENEWABLE ENERGY CENTRE

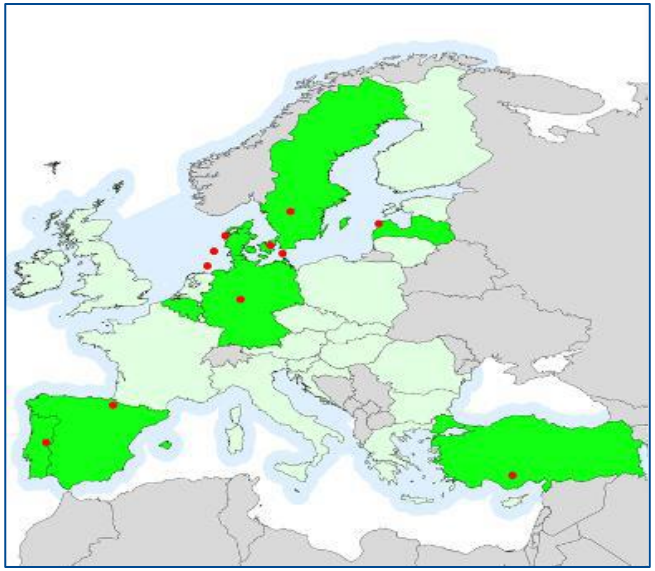
ADItech

Barcelona Supercomputing Center
Centro Nacional de Supercomputación

EXCELENCIA SEVERO OCHOA

New European Wind Atlas (NEWA)

Initial extension of the European domain for the New European Wind Atlas and location of high fidelity experiments



Objective: Creation and publication of a **high-resolution dataset** of wind conditions in Europe to be used as a key tool for the wind energy sector.

- Wind resource information
- Site suitability conditions
- Wind predictability

Task 3.2 (Earth Sciences Department (BSC) - CENER): Development of information about wind predictability at different time horizons.

Wind predictability at different time horizons

Weather forecasts

1-15 days

Climate predictions

10-32 days — **Sub-seasonal**

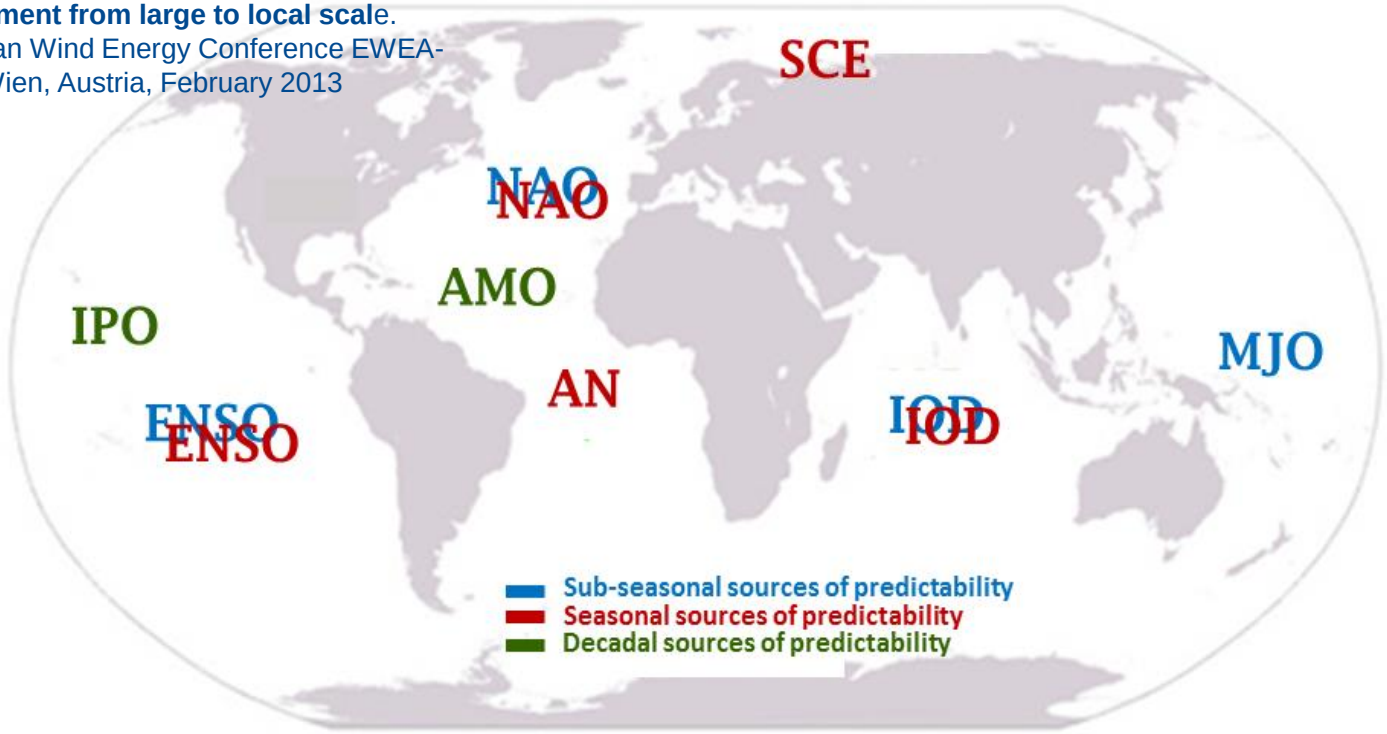
1-15 months — **Seasonal**

2-30 years — **Decadal**

Climate projections

20-100 years

Sanz Rodrigo J, Frías P.L, Stoffels N, von Bremen L (2013) **Wind power predictability assessment from large to local scal**e. European Wind Energy Conference EWEA-2013, Wien, Austria, February 2013



Data description

Variable	10-m wind speed
Target season	Winter (December- January- February)
Climate prediction systems	• **Sub-Seasonal** : ECMWF Monthly Prediction System, NCEP Ensemble and CMA model • **Seasonal** : ECMWF System 4, MF System 4, Glosea5
Reanalyses	ERA-Interim, MERRA-2 , JRA-55
Verification measures	• Correlation • RPSS (Ranked Probability Skill Score)

Methodology

Predictability assessment of near-surface wind speed

- **Skill evolution with the lead time**
- **Predictability from NAO and ENSO**

Methodology

Predictability assessment of near-surface wind speed

Skill evolution with the lead time

Sub-seasonal time-scales

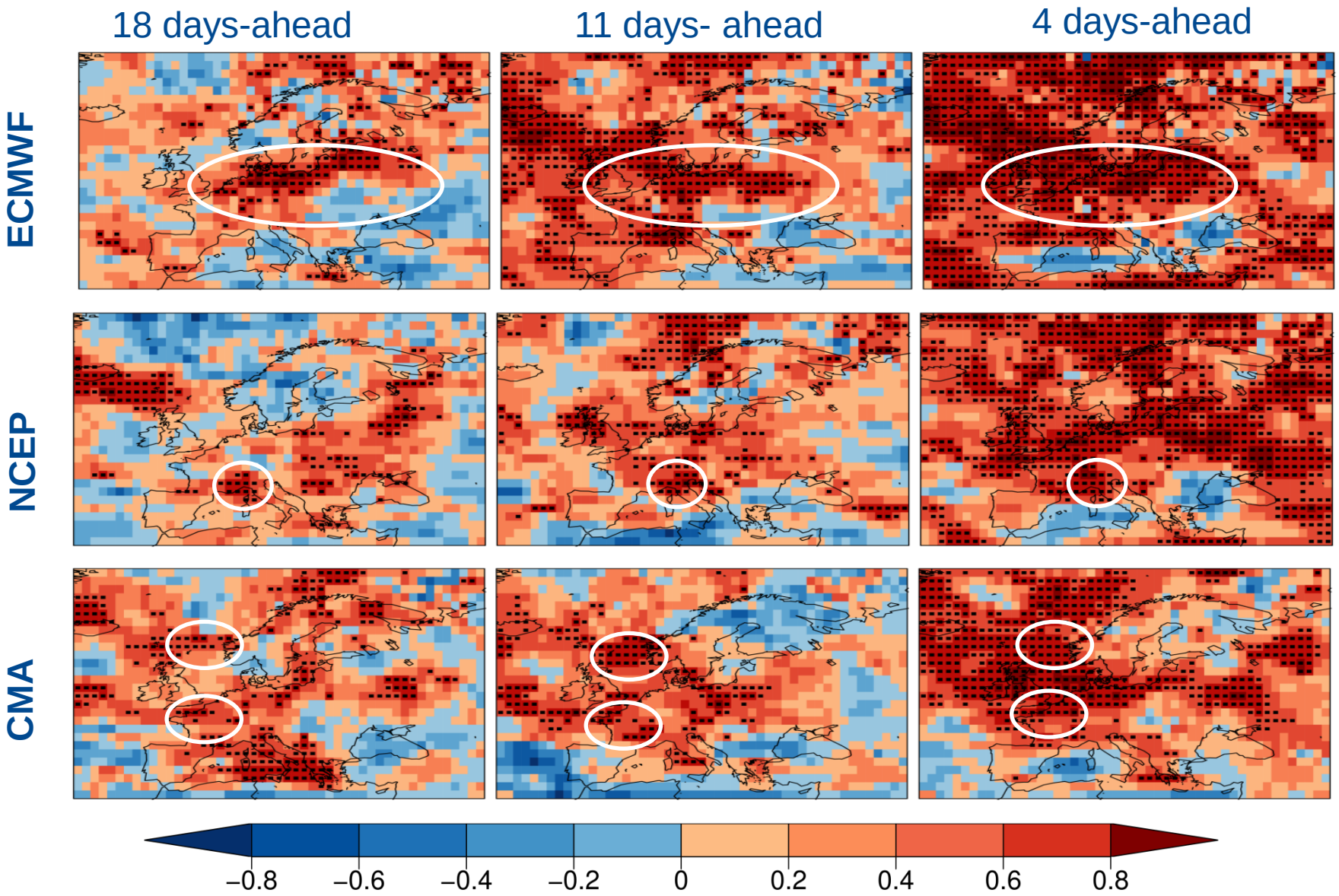
Comparison of the predictability of 10-m wind speed in different prediction systems.

Predictability from NAO and ENSO

Sub-seasonal predictability in Europe

Correlation

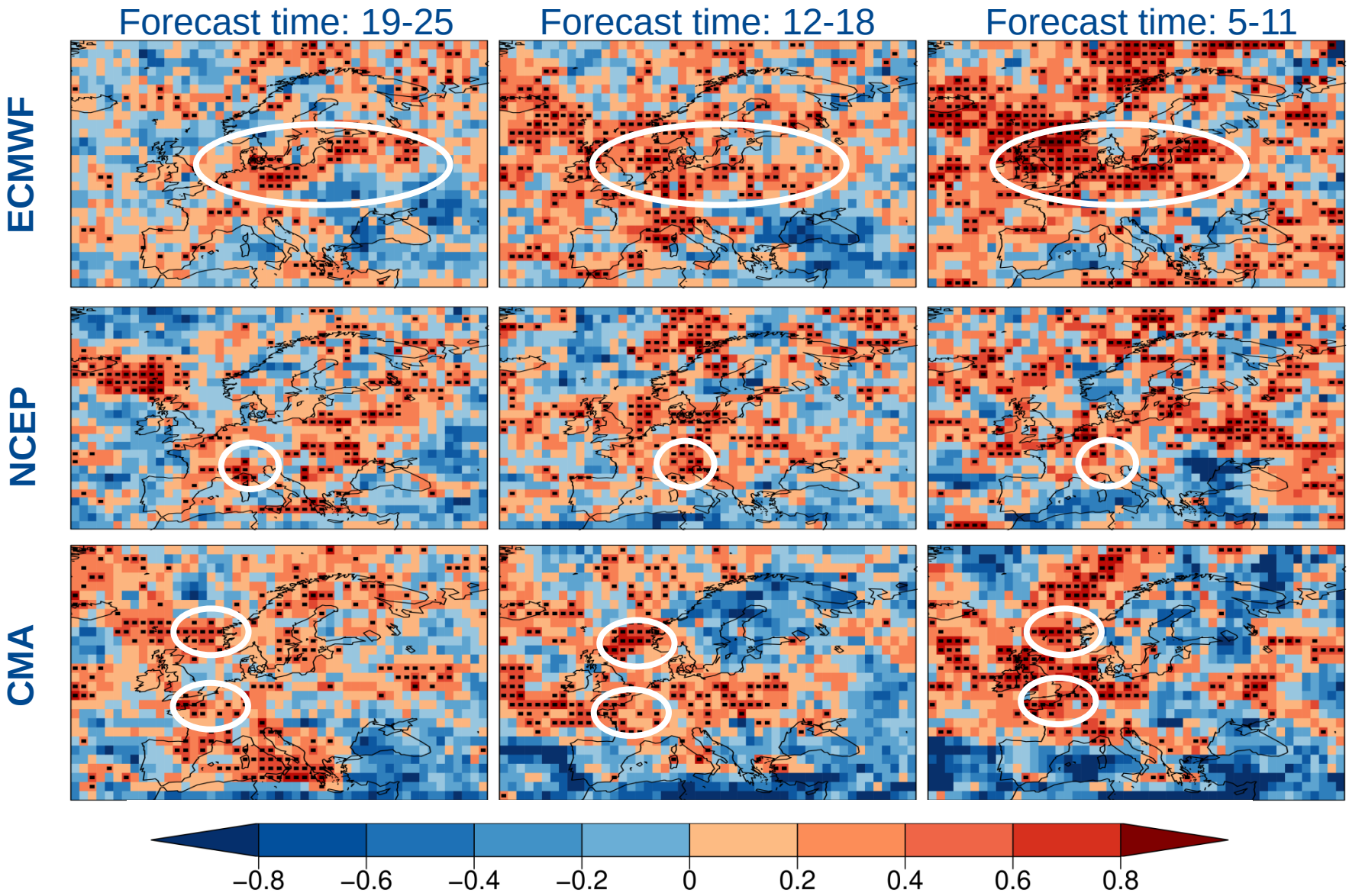
Target: Week 2nd – 8th February 2015



Sub-seasonal predictability in Europe

RPSS

Target: Week 2nd – 8th February 2015



Methodology

Predictability assessment of near-surface wind speed

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Comparison of the predictability of 10-m wind speed in different prediction systems.

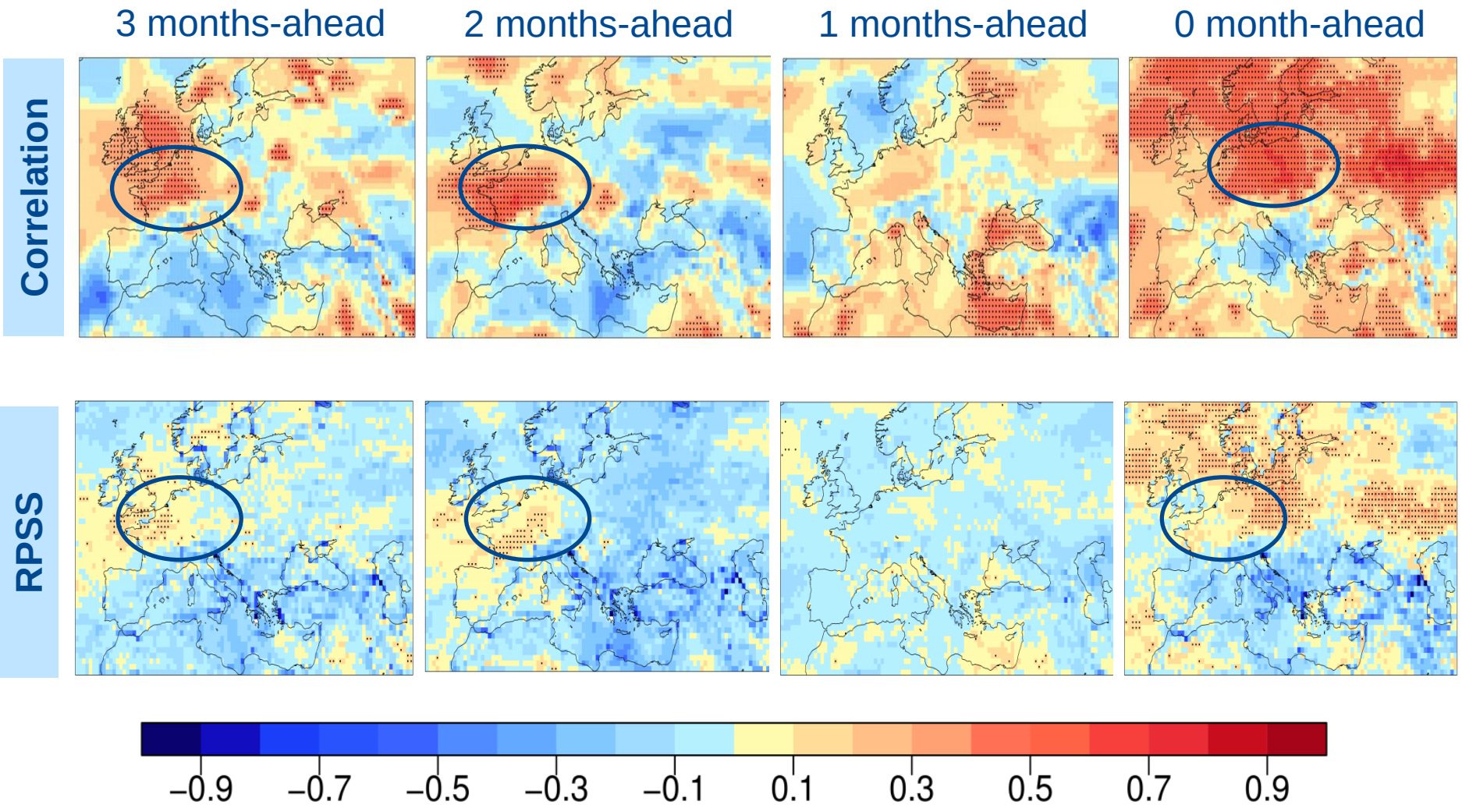
Seasonal time-scales

Analysis in European region and in specific locations.

Predictability from NAO and ENSO

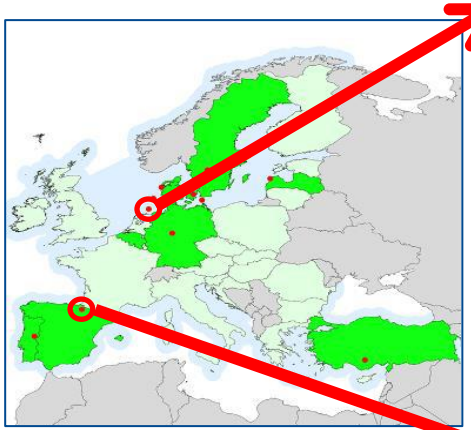
Seasonal predictability in Europe

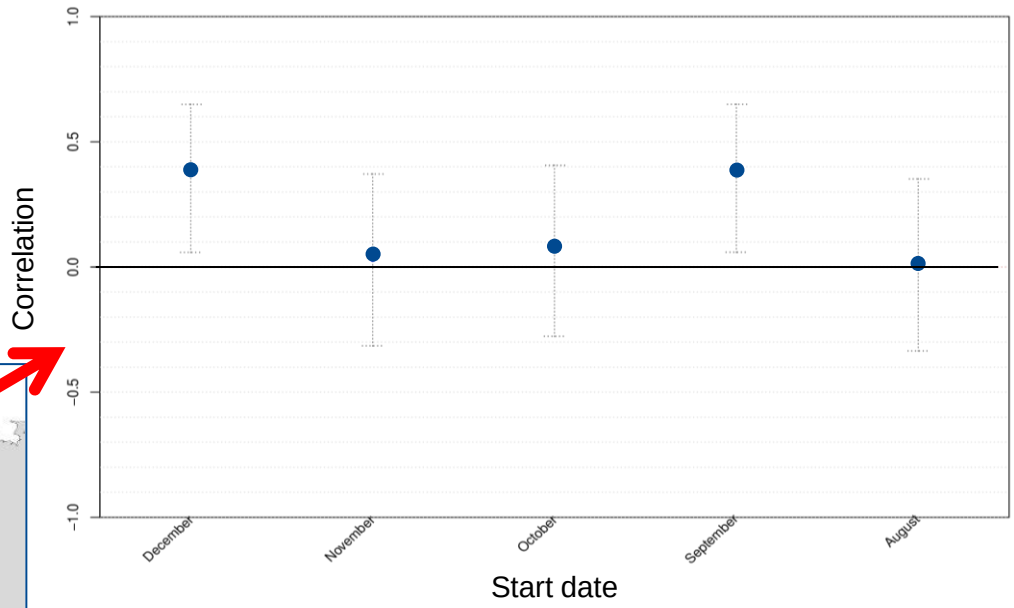
ECMWF System 4 **Target: Boreal Winter (December-January-February)**

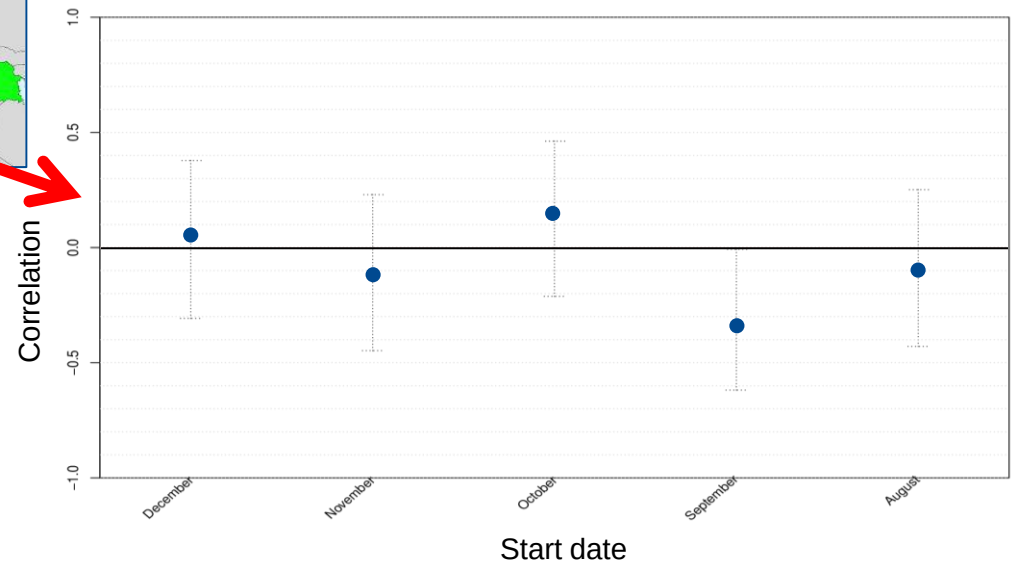


Seasonal predictability at specific locations

ECMWF System 4 **Target: Boreal Winter (December-January-February)**







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Predictability assessment of near-surface wind speed

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Seasonal time-scales

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Predictability from NAO and ENSO

Impact maps

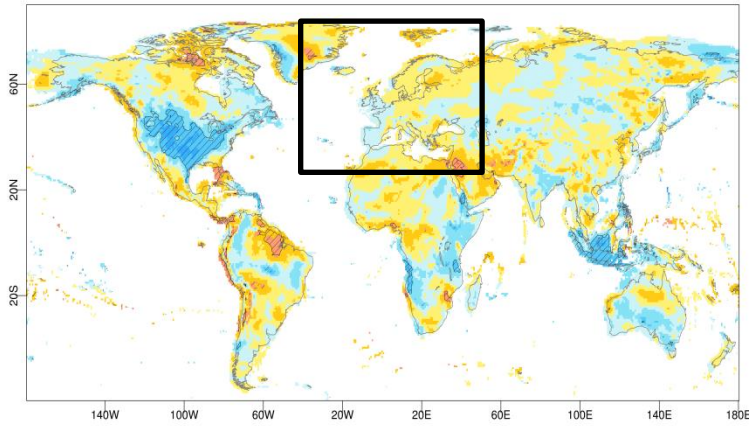
Evaluation of the relationship between modes of variability and wind speed

Wind speed drivers: ENSO and NAO

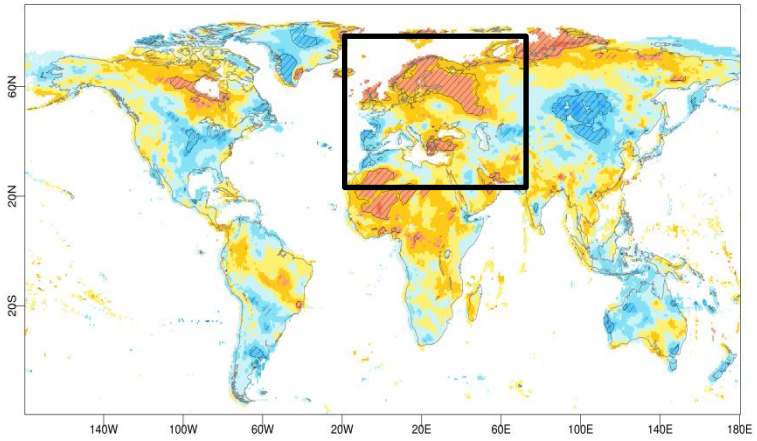
ERA-Interim **Target: Boreal Winter (December-January-February)**

Impact maps of NINO and NAO over 10-m wind speed

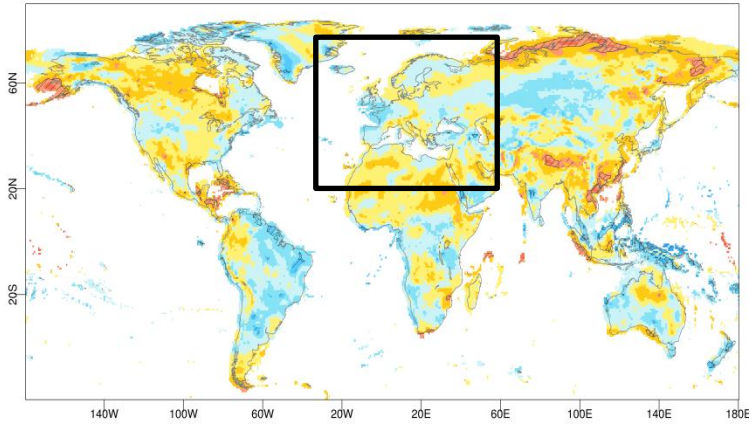
NINO +



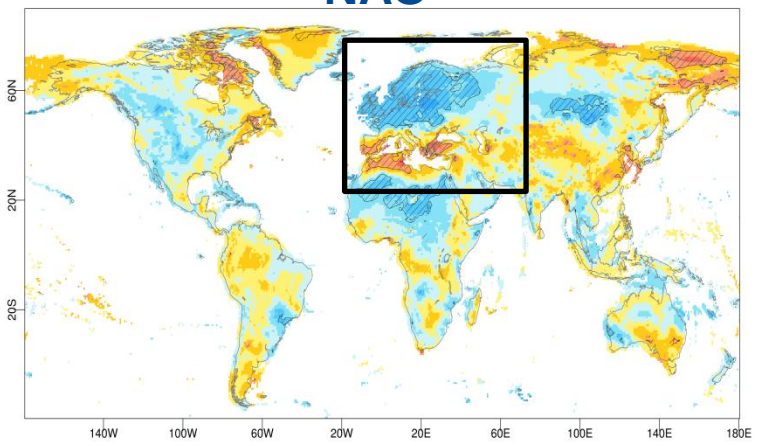
NAO +

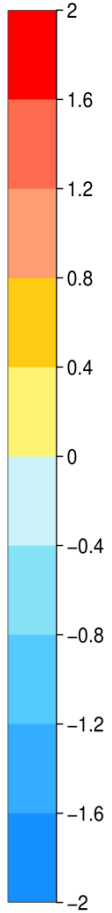


NINO -



NAO -





Methodology of the predictability assessment

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Impact maps

Evaluation of the relationship between modes of variability and wind speed

Reconstructed wind speed

A linear model has been developed to predict 10-m wind speed based on NAO

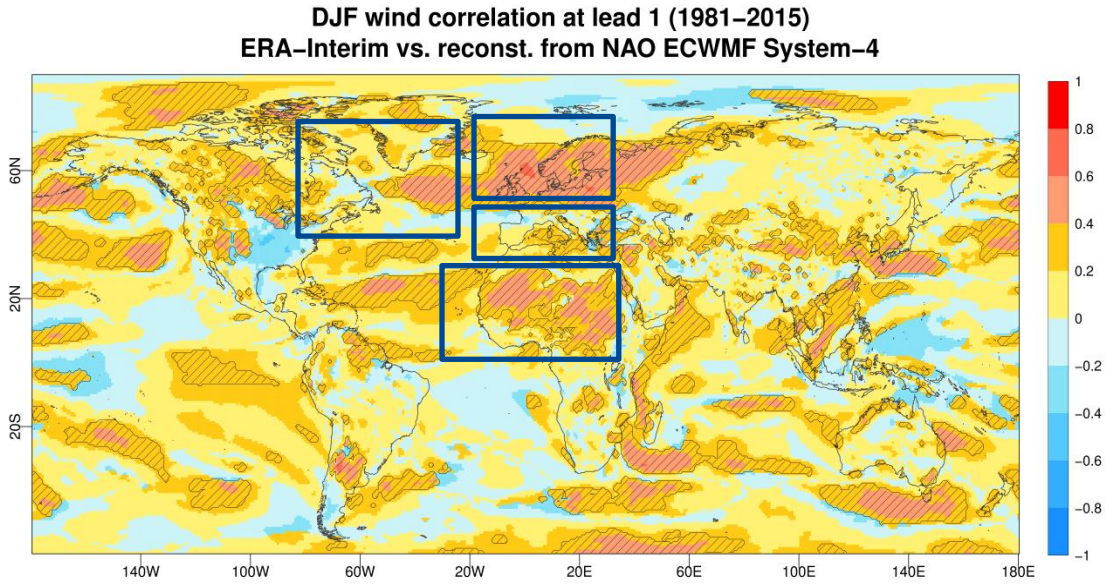
NAO seasonal forecasts

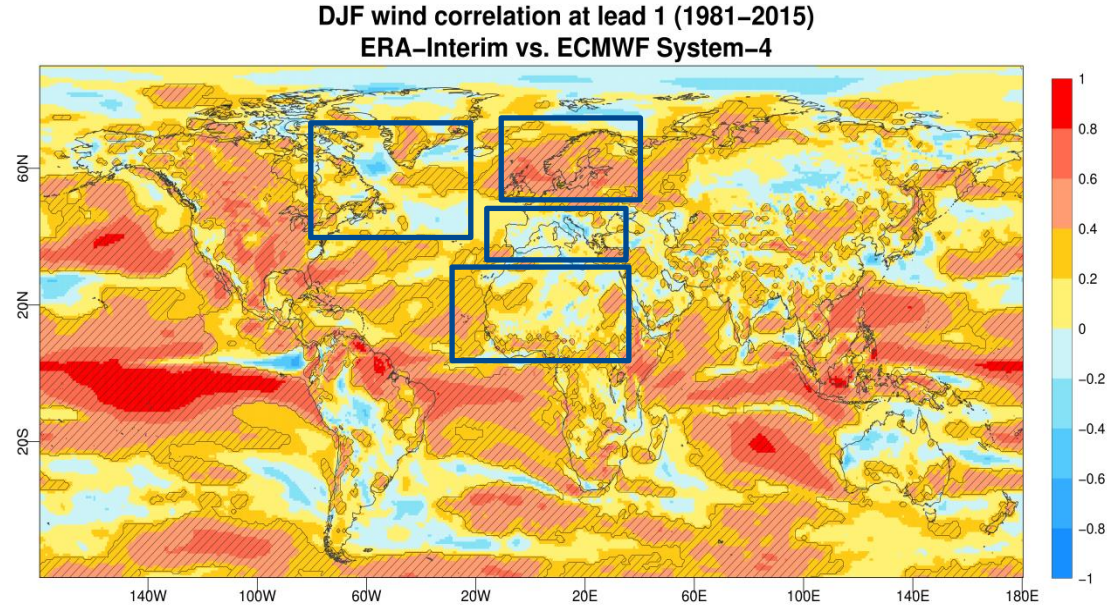
1) Construction of linear model based on ERA-Interim (NAO, 10-m wind speed)

2) NAO seasonal prediction (PC-based) from S4 SLP seasonal forecasts

3) NAO seasonal forecast is introduced in the linear model (from step 1) to estimate 10-m wind speed seasonal predictions

4) Validate 10-m wind speed predictions estimated from NAO model with the direct output from S4





Conclusions and prospects

•This study describes the methodology to produce **predictability information** for the wind industry that can complement the model chain used to develop the New European Wind Atlas.

• Subseasonal prediction systems display **statistically significant levels of skill** for the three lead times, but the **ECMWF** Monthly Prediction System displays the best performance.

• Seasonal prediction system shows **potential skill** in some regions, however the sources of predictability need to be further explored.

• NAO has a **marked effect upon wind speed** in Europe.

• These results can enhance our confidence in the ability of the systems to predict wind speed.

Next steps

1) Verification against other data bases
2) Application of bias-correction techniques
3) Assessment of different forecast systems
4) Summarize all information in easy interpretable format

Thank you

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